

Appl. No. 09/634,522

LISTING OF CLAIMS

This listing of claims replaces all prior versions and listings of claims in the patent application.

1. (Previously Presented) A composite material comprising:
a matrix material; and
a plurality of microsphere particles in the matrix material, the microsphere particles ranging from about 40% by volume to about 85% by volume of the composite material and consisting essentially of diameters ranging from about 1 micron to about 350 microns.
2. (Original) The composite material of claim 1, wherein the plurality of particles range from about 69% by volume to about 81% by volume of the composite material.
3. (Original) The composite material of claim 1, wherein the plurality of particles comprise about 75% by volume of the composite material.
4. (Original) The composite material of any one of claims 1-3, wherein the plurality of particles comprise at least a plurality of first particles and a plurality of second particles having different sizes compared to each other.
5. (Previously Presented) The composite material of any one of claims 1-3, wherein the plurality of microsphere particles are hollow microspheres.
6. (Original) The composite material of claim 5, wherein the hollow microspheres comprises at least two different sized microspheres.
7. (Previously Presented) The composite material of any one of claims 1-3, wherein substantially any given distance between adjacent microsphere particles is less than a diameter of the smallest microsphere particle.

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8. (Original) The composite material of any one of claims 1-3, wherein substantially all of the plurality of particles are in contact with adjacent particles.

9. (Original) The composite material of any one of claims 1-3, wherein the particles are selected from the group consisting of ceramic particles, glass particles, plastic particles, and combinations thereof.

10. (Original) The composite material of any one of claims 1-3, wherein the matrix material is selected from group consisting of epoxies, polyesters, vinyl esters, phenolics, thermoplastics, thermosets, polyurethanes, glues, cements, matrix material binders, and combinations thereof.

CA 11. (Original) The composite material of any one of claims 1-3, further comprising at least one layer of material in contact with the matrix material having the particles.

12. (Original) The composite material of claim 11, wherein the at least one layer is selected from the group consisting of carbon fibers, glass fibers, uni-directional fibers, cross woven fibers, matte fibers, fiber braid, uni-directional stitch woven carbon fiber braid, plastics, leathers, foils, metals, laminates, composites, thermoplastics, thermoset materials, resins, ceramics, vinyls, rigid materials, flexible materials, flanking materials, and combinations thereof.

13. (Original) The composite material of any one of claims 1-3, wherein the composite material has a specific gravity of from about 0.38 to about 2.2.

14. (Original) The composite material of any one of claims 1-3, wherein the composite material has a specific gravity of less than 1.0.

15. (Previously Presented) A composite material comprising:
a matrix material from about 15% by volume to about 60% by volume; and
microspheres from about 40% by volume to about 85% by volume, substantially all of the microspheres having diameters ranging from about 1 micron to about 350 microns.

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16. (Original) The composite material of claim 15, wherein the matrix material is from about 19% by volume to about 31% by volume, and the microspheres are from about 69% by volume to about 81% by volume.

17. (Original) The composite material of claim 16, wherein the matrix material is about 25% by volume, and the microspheres are about 75% by volume.

18. (Previously Presented) A composite material comprising a matrix binder material and microspheres, the microspheres having a greater volume than the matrix binder material and consisting essentially of diameters ranging from about 1 micron to about 350 microns.

19. (Previously Presented) A composite material comprising:
a core having a matrix material from about 15% to about 60% by volume of the core, and microspheres from about 40% to about 85% by volume of the core, substantially all of the microspheres having diameters ranging from about 1 micron to about 350 microns; and
a flanking layer bonded to the core.

20. (Original) The composite material of claim 19, wherein the core has flanking layers bonded to opposite sides of the core.

21. (Original) The composite material of claim 19, wherein the flanking layer substantially surrounds the core.

22. (Original) The composite material of claim 19, wherein the flanking layer is selected from the group consisting of carbon fibers, glass fibers, uni-directional fibers, cross woven fibers, matte fibers, fiber braid, uni-directional stitch woven carbon fiber braid, plastics, leathers, foils, metals, composites, thermoplastics, thermoset materials, resins, ceramics, vinyls, rigid materials, flexible materials, and combinations thereof.

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23. (Withdrawn) A method of making a composite material comprising the steps of:
mixing particles in a matrix material until the matrix material is substantially saturated
with the particles;
forming the mixed matrix material and particles into a desired shape; and
curing the matrix material.

24. (Withdrawn) The method of claim 23, wherein the mixing step further comprises
forcing the particles towards each other under pressure.

25. (Withdrawn) The method of claim 24, further comprising the step of removing a
portion of the matrix material by passing the portion of the matrix material through a filter while
retaining the particles.

26. (Withdrawn) The method of claim 23, further comprising the step of bonding a
flanking layer to the mixed matrix material and particles.

27. (Withdrawn) The method of claim 26, wherein the flanking layer is bonded by
curing the matrix material.

28. (Previously Presented) A composite material comprising a matrix binder and
microparticles, wherein said microparticles comprise a greater weight percentage of said
composite material than said matrix binder, said microparticles consisting essentially of sizes
ranging from about 1 micron to about 350 microns.

29. (Previously Presented) A composite material comprising:
up to 50% by weight of a matrix binder; and
from about 50% or greater by weight microparticles based upon the total weight of said
composite material, said microparticles consisting essentially of sizes ranging from about 1
micron to about 350 microns.

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30. (Previously Presented) A composite material comprising a matrix binder and microparticles, wherein said microparticles comprise a lesser weight percentage of said composite material than said matrix binder, substantially all of said microparticles having sizes ranging from about 1 micron to about 350 microns.

31. (Previously Presented) A composite material comprising:
up to 50% by weight microparticles; and
from about 50% or greater by weight of a matrix binder based upon the total weight of said composite material, substantially all of said microparticles having sizes ranging from about 1 micron to about 350 microns.

32. (Previously Presented) The composite material of claim 31, wherein said composite material comprises from about 30% to about 45% by weight said microparticles; and from about 70% to about 55% by weight said matrix binder based upon the total weight of said composite material.

33. (Previously Presented) The composite material of claim 31, wherein said composite material comprises from about 38% to about 41% by weight said microparticles; and from about 72% to about 59% by weight said matrix binder based upon the total weight of said composite material.

34. (Previously Presented) The composite material of claim 28, wherein the microparticles are microspheres.

35. (Previously Presented) The composite material of claim 29, wherein the microparticles are microspheres.

36. (Previously Presented) The composite material of claim 30, wherein the microparticles are microspheres.

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37. (Previously Presented) The composite material of claim 31, wherein the microparticles are microspheres.

38. (Previously Presented) The composite material of claim 1, wherein the microsphere particles consist essentially of diameters ranging from about 15 microns to about 120 microns.

39. (Previously Presented) The composite material of claim 38, wherein substantially all of the microsphere particles have a single, nominal diameter.

40. (Previously Presented) The composite material of claim 15, wherein substantially all of the microspheres have diameters ranging from about 15 microns to about 120 microns.

41. (Previously Presented) The composite material of claim 40, wherein substantially all of the microspheres have a single, nominal diameter.

42. (Previously Presented) The composite material of claim 18, wherein the microspheres consist essentially of diameters ranging from about 15 microns to about 120 microns.

43. (Previously Presented) The composite material of claim 42, wherein substantially all of the microspheres have a single, nominal diameter.

44. (Previously Presented) The composite material of claim 19, wherein substantially all of the microspheres have diameters ranging from about 15 microns to about 120 microns.

45. (Previously Presented) The composite material of claim 44, wherein substantially all of the microspheres have a single, nominal diameter.

46. (Previously Presented) The composite material of claim 28, wherein the microparticles consist essentially of sizes ranging from about 15 microns to about 120 microns.

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47. (Previously Presented) The composite material of claim 46, wherein substantially all of the microparticles have a single, nominal size.

48. (Previously Presented) The composite material of claim 29, wherein the microparticles consist essentially of sizes ranging from about 15 microns to about 120 microns.

49. (Previously Presented) The composite material of claim 48, wherein substantially all of the microparticles have a single, nominal size.

50. (Previously Presented) The composite material of claim 30, wherein substantially all of the microparticles have sizes ranging from about 15 microns to about 120 microns.

51. (Previously Presented) The composite material of claim 50, wherein substantially all of the microparticles have a single, nominal size.

52. (Previously Presented) The composite material of claim 31, wherein substantially all of the microparticles have sizes ranging from about 15 microns to about 120 microns.

53. (Previously Presented) The composite material of claim 52, wherein substantially all of the microparticles have a single, nominal size.

54. (New) The composite material of any one of claims 1-3 and 39, wherein the composite material is substantially free of voids in the matrix material between the microsphere particles.

55. (New) The composite material of claim 7, wherein the composite material is substantially free of voids in the matrix material between the microsphere particles.

56. (New) The composite material of claim 13, wherein the composite material is substantially free of voids in the matrix material between the microsphere particles.

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57. (New) The composite material of claim 14, wherein the composite material is substantially free of voids in the matrix material between the microsphere particles. *OK*

58. (New) The composite material of any one of claims 15-17 and 41, wherein the composite material is substantially free of voids in the matrix material between the microspheres. *OK*

59. (New) The composite material of any one of claims 18 and 43, wherein the composite material is substantially free of voids in the matrix material between the microspheres. *OK*

C1 60. (New) The composite material of any one of claims 19 and 45, wherein the composite material is substantially free of voids in the matrix material between the microspheres. *OK*

61. (New) The composite material of any one of claims 28 and 47, wherein the composite material is substantially free of voids in the matrix material between the microparticles. *OK*

62. (New) The composite material of any one of claims 29 and 49, wherein the composite material is substantially free of voids in the matrix material between the microparticles. *OK*

63. (New) The composite material of any one of claims 30 and 51, wherein the composite material is substantially free of voids in the matrix material between the microparticles. *OK*

64. (New) The composite material of any one of claims 31-33 and 53, wherein the composite material is substantially free of voids in the matrix material between the microparticles. *OK*